fibres derived from the ventral horn cells of the cord and distributed to the striated body musculature; (2) somatic sensory or general cutaneous fibres terminating in the dorsal horn and supplying the skin of the body; (3) visceral motor fibres supposed to pass from the lateral horn outward by both dorsal and lateral roots; and (4) visceral sensory fibres passing in through the dorsal roots only. In the cranial nerves, in addition to these four components, a fifth, the acustico-lateral, can be distinguished in connection with the ear and lateral line organs. No cranial nerve contains all these components, and there is an obvious tendency towards the concentration of the fibres of each component, so as to form a single system with a common center in the medulla.

The composition of the various cranial nerves is as follows. The hypoglossal is composed of somatic motor fibres and passes out as the first member of the first spinal complex. The spinal accessory is made up of visceral motor fibres and passes out with the vagus to innervate the trapezius muscle. The vagus is in the main formed of visceral motor and visceral sensory fibres, together with a few somatic sensory and acustico-lateral fibres. The glossopharyngeal contains only visceral motor and visceral sensory fibres. The auditory is exclusively acustico-lateral. The facial is composed of visceral motor, visceral sensory, and acustico-lateral fibres. The abducens is wholly somatic motor. The trigeminal is visceral motor and somatic sensory. The trochlear and oculomotor are both somatic motor. The optic and olfactory nerves have not as yet been placed in any category.

G. H. P.

Reactions of Entomostraca to Light. — R. M. Yerkes[1] has studied the reactions of two entomostracans, Simocephalus and Cyclops, to differences in light intensity, photopathy. In the experiments the influence of the direction of the light was eliminated and the animals were subjected to light of graduated intensity. Simocephalus moved into regions of greater intensity of light, *i.e.*, was positively photopathic; and the amount of positive movement varied, within certain limits, directly with the intensity of the light. Diffuse daylight caused a greater positive response than direct sunlight. Cyclops proved to be not photopathic. It was also shown that Simocephalus preferred the orange and yellow portion of the spectrum of illuminating gas, but the author concludes that this is a response to inten-

[1] Yerkes, R. M. Reactions of Entomostraca to Stimulation by Light, *Amer. Journ. Physiol.*, vol. iii, pp. 157–182. November, 1899.

sity (photopathic reaction), and is not, as far as is known, a color response (chromopathy). G. H. P.

Embryology of the Cladoceran Penilia. — The development of Penilia has been studied by M. T. Sudler.[1] The four to six oval eggs of a single laying are usually so placed in the brood sac of the female that their long axes are very nearly parallel to that of the female. The long axis of the egg corresponds to that of the future embryo, and the end of the embryo pointed forward in the brood sac becomes the head. The segmentation of Penilia is total and remains so throughout in strong contrast to that in most other Crustacea. As in Nereis, the first cleavage plane is transverse to the chief axis of the future embryo; the second is in the sagittal plane; and the third is at right angles to both previous planes; the fourth is parallel to the first; and from the fifth on, no clear characterization can be made. Gastrulation takes place in definite relation to the maternal body, *i.e.*, at what may be described as the outer posterior corner of the embryo. The mesoderm originates from either side of the mid-ventral line, and in a way that prevents it from being clearly distinguished from the entoderm for some time. The gastrula mouth closes in the region afterwards occupied by the anus. The order of appearance of the appendages is open to some variation, but is usually as follows: second antenna, first antenna, mandible, first maxilla, second maxilla, thoracic appendages in sequence from the anterior end. Organogeny is briefly dealt with. The reproductive organs cannot be traced to a single cell, as in Moina according to Grobben. On the whole, Penilia gives evidence of being a highly specialized rather than a primitive cladoceran. G. H. P.

Artificial Parthenogenesis in the Sea Urchin. — Observations on the influence that various dissolved substances have on living muscle and on the fertilized and unfertilized eggs of marine animals have led Loeb[2] to suspect that the reason unfertilized eggs do not develop is not only because of lack of the spermatozoan, but also because of the constitution of the sea water. The addition of magnesium chloride to sea water (5000 $\frac{1}{8}$ n $MgCl_2$ in 5000 cc. of sea

[1] Sudler, M. T. The Development of Penilia schmackeri Richard, *Proc. Boston Soc. Nat. Hist.*, vol. 29, pp. 109–131, 3 plates. October, 1899.

[2] Loeb, J. On the Nature of the Process of Fertilization and the Artificial Production of Normal Larvæ (Plutei) from Unfertilized Eggs of the Sea Urchin, *Amer. Journ. Physiol.*, vol. iii, pp. 135–138. October, 1899.